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The impact of higher oil prices on Southern African countries

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Abstract
In determining the magnitude of oil shocks to the economies of Southern Africa, it is essential that we examine the various components of vulnerability, as well as the crude oil price movements and the relationship between energy and development. Because energy consumers and producers are constrained by their energy consuming appliances which are fixed n the short-run, thus making it difficult to shift to less oil intensive means of production in response to higher oil prices, oil price shocks increase the total import bill for a country largely because of the huge increase in the cost of oil and petroleum products. Low-income countries and poorer households tend to suffer the largest impact from oil price rise.

Keywords: vulnerability, oil intensities, price shocks, oil dependence

Introduction

Most Southern African countries are completely depended on imported oil as a primary energy source and are therefore highly vulnerable to oil price shocks. The oil price increases have significant impacts on the economy's level of real gross domestic product (GDP) and economic performance. The oil price increases reduce the national output, change the structure of spending and production and shifts the economy to a lower economic growth path. This affects the rate of inflation and, at the same time, alters the structure of relative prices, and the economy's import bills are strained adding to the adverse shift in their terms of trade. The actual impact of oil changes varies markedly by country, and depends on, at least, two factors: the degree to which they are net oil importers and the energy and oil intensities of their economies.

The purpose of this study is to determine the magnitude of oil price shocks to the economies of Southern Africa. We do so by first providing a background about the energy and development in these economies, look at international crude oil price movements, and then determine Southern Africa's energy and oil intensities, and oil dependence aspects. Oil price shocks increase the total import bill largely because of the huge increase in the cost of oil and petroleum products. The International Energy Outlook (2004 p5, 25) argues that the link between energy consumption and economic growth are closely correlated in developing countries, with energy demand growth tending to track the rate of economic expansion. Bacon and Mattar (p1 2005) also report that low-income countries and poorer households in developing countries suffer the largest impact from oil price rise.

The organization of this paper is as follows. The first section looks at energy and development to understand the economies being discussed. This is followed by a brief discussion on the price of crude oil. We then show in the third section, the methodology for looking at vulnerability and then discuss our findings. The Southern African countries we consider all fall within the Southern African Development Community (SADC). For the most part, our observations range from 1994, when South Africa won its first democratic elections, to 2003 as determined by data availability.

Energy and development

Southern African economies

The individual economies of Southern African countries are structurally diverse, their economic performance is mixed, and they are at different stages of development. South Africa has the most developed, diversified and self-driven economy, with the gross domestic product (GDP) that is more than double of the other Southern African countries combined (Figure 1). For most of the economies, the agricultural contribution to GDP dominates other sectors. Oil production is Angola's backbone of the economy, and the upstream oil industry con-

tributes about 50% to GDP and is the major source of the country's foreign exchange. Botswana's export sector is dominated by diamond mining, and the government is aiming to diversify the export base and reduce the vulnerability of relying on diamonds. Persistent macroeconomic instability and poor links between the capital intensive oil sector and the rest of the economy in Angola, inappropriate policy mix in Zimbabwe, and civil conflict in the DRC have adversely affected the economic performance of these countries. Economic growth is attributed to restructuring in Tanzania, the diversification of the economy in Zambia and Malawi, the investment in the Lesotho water project and higher manufacturing production in Lesotho, and construction activities in Mozambique.

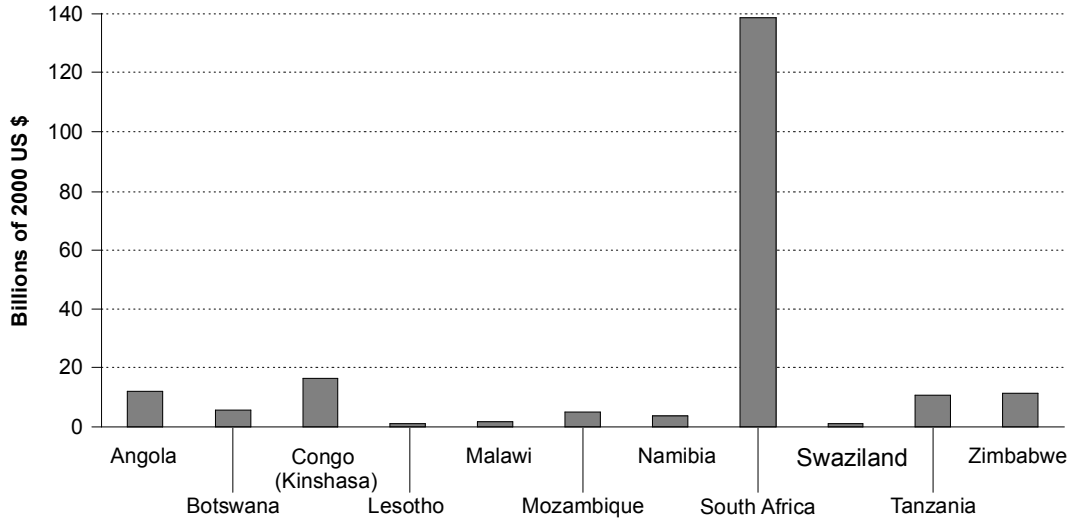
Low growth rates were experienced in the early 1990s as a result of the region-wide drought, the 'Asian crisis' resulting in depressed global demand, and low international commodity prices. Civil conflict in the DRC explains negative GDP growth rates from 1996 to 2000. While all countries had positive growth rates in 2003, Botswana, Mozambique and Tanzania achieved growth rates above 5% largely because of sound economic management. Then is the problem of inflation. The South African Customs Union, consisting of countries which peg their currencies to the South African Rand, experienced sharp falls in average consumer price inflation as the South African Rand continued to firm against major currencies. The annual inflation rate of 432% in Zimbabwe (IMF p22 2004) is attributed to demand and supply imbalances in the economy as well as a range of cost push factors. Estimates further reveal that HIV/AIDS is reducing welfare and depressing economic growth by up to 1.5%, with the worst affected countries as South Africa, Botswana, Namibia, Swaziland and Lesotho. High oil prices have therefore added to the low growth prospects of these national economies.

Energy and GDP

Even given the paucity of oil resource endowment, the presence or absence of refining capacity in any of the countries is crucial. Refineries are concentrated in South Africa with a refining capacity of 708 000 billion barrels per day, with other refineries in Angola (39 000 billion barrels per day), Tanzania (14 000 billion barrels per day) and Zambia (23 750 billion barrels per day). South Africa exports some of its refinery output to Botswana, Lesotho, Swaziland and Namibia. Most of Malawi's fuel imports are supplied via Tanzanian and South African ports. Pipelines transport crude oil from Tanzania to Zambia and from Mozambique to Zimbabwe. Supply is thus not only vulnerable to supply interruption by oil producing countries and high crude oil prices, but to the political stability of transit countries as well. But the vulnerability of these landlocked countries largely depends on the degree of their dependence on oil imports and the oil intensity of their economies.

The South African economy dominates the region's consumption of both petroleum and total energy (Figure 2). While it can be said that energy consumption is an indicator of industrial progress and the standard of living for its people, it is equally important to realise that rapid economic growth requires increases in the consumption of commercial energy.

The relationship between countries at the most aggregated level (see Figure 3) is an almost perfect positive correlation (R^2 = 0.99) between energy consumption and output or income or growth (as



Note: Gross domestic product using market exchange rates per country, 2003

Figure 1: Gross domestic product per country, 2003
Source: Data based on IEA, 2003

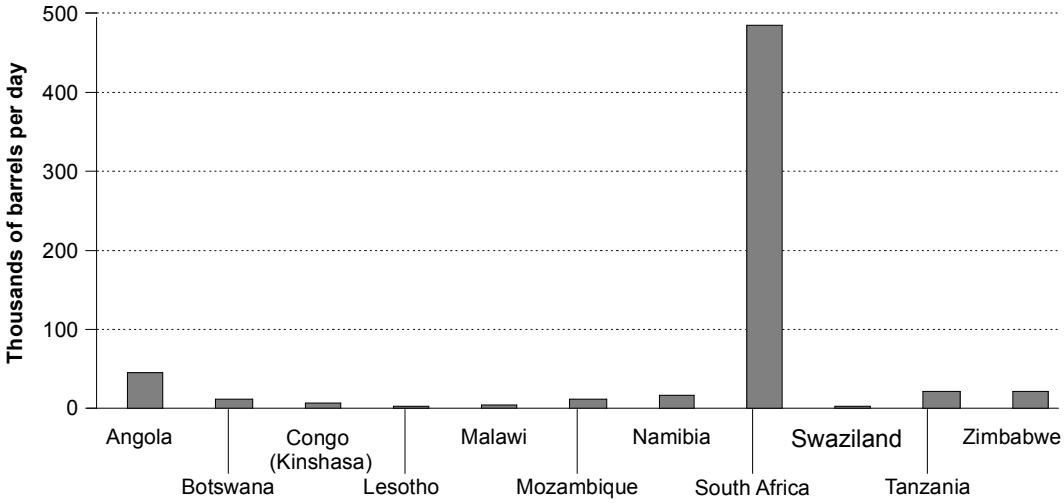


Figure 2: Petroleum consumption, 2003
Source: Data based on IEA, 2003

measured by GDP). There is, however, ambiguous about the direction of causation, leaving open whether economic growth is a function of having more energy, or whether energy arises from increased economic growth. We argue, however, that energy use while being a necessary input for economic growth is also a function for growth. The strength of this relationship varies among countries and their stages of economic development. We also observe that the estimates of South Africa (the country with the highest output, GDP, $R^2 = 0.83$) and Lesotho (with the lowest output, GDP, $R^2 = 0.51$), show that income elasticity of energy consumption 1<Lesotho<South Africa or income elasticity of high income countries >low income. It is difficult to draw any conclusions about the real meaning of these elasticities for reasons related to the effects of technological improvements, the structure of GDP, and the need to isolate the composition of energy consumption in the energy/GDP relationship. However, the very strong correlation we observe in Figure 3 between energy consumption and growth indicates that economic activity is seriously constrained without energy. To the extent that economic growth, with the jobs and income and development it creates, depends on price and reliable supplies of energy, and since energy consuming technology is fixed in the short-run, oil price hikes are bound to have an effect on national output and other macroeconomic variables.

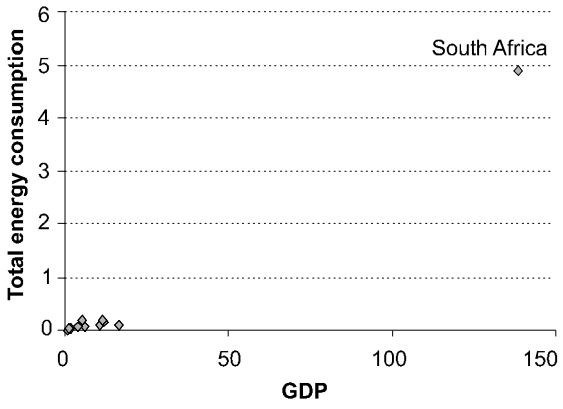


Figure 3: Energy and GDP in 2003
Source: Data based on IEA, 2003

Development

The biggest challenge facing Southern African countries is to increase both development and economic growth. These factors are linked with energy demand. Table 1 captures various indicators for development related to well-being, income inequality, and poverty and debt burden. The 2003 data for the Human Development Index (HDI), equated to well-being, shows that Botswana, Namibia, South Africa and Zimbabwe achieved the medium development status (50% < HDI < 79.9%), while the rest of the Southern African countries fell under the low level of human development (HDI < 50%) classification.

One must take into account that the static measure of HDI is not so comprehensive as to capture entirely the concept of human development. Its construction suffers from several problems like discrepancies in data sources, lack of agreement in the value to be included in the composite, and does not capture a person's ability to participate in decisions that affect his/her life. The Gini coefficient, on the other hand, measuring the degree of inequality in the distribution of income, shows high coefficient results (> 50%) for most countries, implying a much skewed distribution of income in Southern African economies. Even though the coefficients for Tanzania and Mozambique are below 50%, Mozambique is among those countries with the worst levels of deprivation. The levels of poverty,

Table 1: Development indicators, 2003

Figures compiled from the Human Development Report (2005) and IEA (2004)

Country	*Human development index[1] (%)*	*Gini coefficient (%)*	*Human poverty index (HPI – 1)[2] (%)*	*Population below income poverty line US$2 a day 1990- 2003*	*Total external debt (in % of GDP)*
Angola	44.5		41.5		37.2
Botswana	56.5	63.0	48.4	50.1	17.8
Lesotho	49.7	63.2	47.6	56.1	47.0
Malawi	40.4	50.3	43.4	76.1	165.8
DRC	38.5	-	41.4	-	187.4
Mozambique	37.9	39.6	49.1	78.4	121.7
Namibia	62.7	70.7	33.0	55.8	2.3
South Africa	65.8	57.8	30.9	34.1	23.2
Swaziland	49.8	60.9	52.9	-	28.2
Tanzania	41.8	38.2	35.8	59.7	59.5
Zambia	39.4	52.6	46.4	87.4	129.3
Zimbabwe	50.5	56.8	45.9	83.0	55.3

1. HDI is a composite index of three measurable dimensions of human development: a decent standard of living (measured by real GDP per capita), education attainment (adult literacy and enrolment rates) and living a long healthy life (life expectancy at birth).
2. HPI-1 variables used are: the percentage of people expected to die before age 40; the percentage of adults who are illiterate; and deprivation in overall economic provisioning-public and private-reflected by the percentage of people without access to health services and safe water and the percentage of underweight children under five.

measured by the Human Poverty Index (HPI-1) to focus on the proportion of people below a threshold level of basic human dimensions of human development, show Swaziland, Mozambique, and Botswana as the worst affected in 2003. When we take into account an extremely contentious measure of US$2 a day (measured in purchasing power parity terms) as a poverty line, Mozambique, Zambia and Zimbabwe become the worst affected. Poor households are thus forced to rely on non-commercial sources of energy.

The debt burden Southern African countries face is a major impediment to growth and economic transformation, since it diverts scarce resources, retards achievement of sustainable development, and inhibits productive investment. As Davidson and Sokona point out (2005 p16), a significant amount of debt was incurred for both development and maintenance of the power sector, and repayment of energy loans in financially stronger currencies pose a hardship since energy services are paid for in unstable local currencies. Together with external factors such as the unfavourable terms of trade, low export growth and high external volatility, crude oil price hikes worsen the debt situation of Southern African countries, and limits resources that can be devoted to poverty alleviation or to meet the Millennium Development Goals. Fortunately, the debt burden is expected to improve because of declining reliance on debt-creating flows and debt forgiveness under the Enhanced Heavily Indebted Poor Countries (HIPC) initiative.

Crude oil price movements

We need to identify the ultimate movers and shakers behind crude oil price movements. Analysis of crude oil price movements on a global level can be divided into three sub-periods, with different influences on price determination and pricing outcomes. During the first period, international oil companies fixed the price of crude oil, and the period was characterized by occasional price shocks rather than continuous price volatility. This price fixing lasted until 1974 when OPEC producers took over the role of fixing the reference price, and maintained this role until 1986. Since 1986, the reference price of crude oil in international trade has been determined in New York and London in the futures exchanges for WTI and Brent, respectively.

Futures prices are sensitive to expectations about developments on supply and demand. These expectations are fuelled by political and economic factors. Mabro (2004) argues that once stability in oil producing countries is under threat, this unnerves the market and fuels expectations, with fears of future development among crude oil traders causing uneasiness about security of supplies. There has also been concern about production

being constrained by available capacity and geopolitical developments as well as reliability of security of supplies particularly given the volatility of the oil rich Middle East countries. At the same time, rapid growth in emerging markets, particularly of China, and the strength of demand from other consumer countries have been key factors to rising prices.

The influence of OPEC on price levels cannot be discounted. OPEC influences price levels and movements by sending signals to futures markets where reference prices are determined. Announcements about production policy are now widely recognized as OPEC's signalling device. Decisions on quota reduction, for example, are taken as an indicator of OPEC's worry about bearish sentiments in the market, which may lead prices to fall. Decisions to increase production, on the other hand, are an expression of OPEC's uneasiness about the high price levels attained. On the whole, crude oil prices behave like other commodities in the market, with wide price swings in cases of shortage or oversupply.

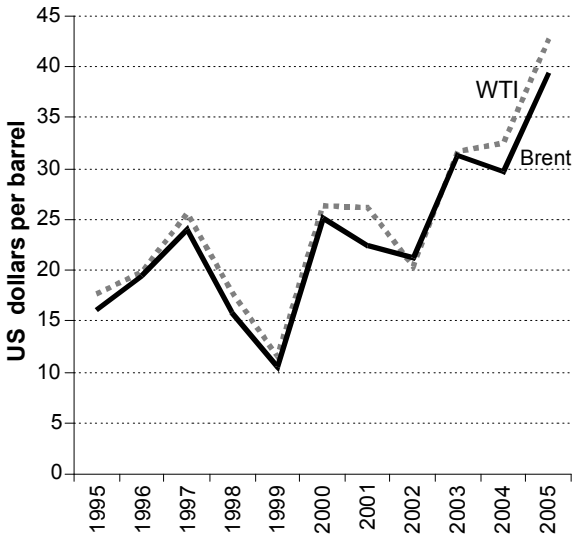


Figure 4: Brent and WTI daily prices 1998 to 2005

Taking into account all these influences on crude oil prices, Figure 4 shows a positive nonlinear price trend from 1995 to early 2005 and with the Brent price closely tracking WTI. The strong US economy and the booming Asian Pacific region contributed to price increases that extended into 1997. Decline in rapid growth of the Asian economies in 1998 as well as lower consumption and higher OPEC production led to a downward spiral in prices. Prices recovered in 1999 in response to: (i) OPEC restricting crude oil production (although not all the quotas were observed); (ii) Asian growing oil demand signifying recovery from crisis; and (iii) the shrinking non-OPEC production. Prices continued to rise in 2000 and then plummeted in November 2001 following successive quota increases, a weakening US economy and increases in non-OPEC production. Soon afterwards, prices rose to the US$ 25 range, and hovered above US$40 per barrel in 2004 as a result of the continued fall of the US dollar, the political tension in the Middle East, the high demand for crude oil by China, and uncertainly about the future of Yukos, the Russian producer.

Bacon and Mattar (2005 p9) use 2003 as a reference period, and estimate that the average price of Brent in recent years rose by 15% in 2003 to US$ 28.8, and by 33% above the 2003 price in 2004, ultimately by an average of 30% from 2004 to mid 2005. The price rise from 2003 to mid-2005 was 72% (from US$28.8 to US$ 49.5), and increased above US$ 55 after mid-2005.

The impact of oil price shocks

Impact of higher prices

Consumers and energy-using producers suffer the worst impact from oil price increases than do increases of other commodities for several reasons. As the prices rise, consumer and producers have little flexibility in reducing their use of oil in the consumption basket and as a factor of production, or even to substitute between other alternative fuels. This is because energy consuming appliances tend to be fixed in the short run, thus limiting the potential for interfuel substitution. The result is that consumers, given their preferences and willingness to substitute between energy and other goods, and producers, given the different characteristics of production and the extent to which oil can be used in different proportions with other energy and non-energy factors, cannot easily change their consumption pattern in the short run or shift to less oil intensive means of production in response to changes in the price of oil. In the transportation sector, demand for oil varies with different forms of transportation so that the impact of price shocks depends on the ability to adapt to particular forms of transportation to make it more efficient. The flexibility in the use of oil or energy in the long run depends on a myriad of other macroeconomic variables such as employment, economic growth and so forth. Our aggregative analysis conceals all these factors but rather provides an on-the-spot impact of price shocks.

To determine the magnitude of the oil price shock, we follow the Bacon and Mattar (2005) methodology, and let

$$OV = (M_L * P_L)/GDP \quad (1)$$

$$= P_L * (M_L/\Sigma L_u) * (L_u/\Sigma E_u) * (E_u/GDP) \quad (2)$$

Where:

OV = Oil vulnerability

M_L = Volume of net oil imports (oil consumption minus oil production)

GDP = Gross domestic product
P_L = Price of oil
L_u = Total oil use
E_u = Total energy use

Expression (1) can be decomposed to some components of oil vulnerability that allow us to estimate the following: M_L/L_u for oil import dependence, L_u/E_u for dependence of oil as an oil resource, and E_u/GDP for energy intensity. Furthermore, we determine oil intensity using the ratio L_u/GDP. Let us consider next the results on oil vulnerabilities these components yield.

Oil import dependence

A major factor explaining high oil vulnerability is the extreme dependence of Southern African countries on imported oil. Except for Angola and the DRC, all the countries are highly exposed to vulnerability to oil shocks with estimated ratios $M_L/L_u = 1$, indicating that they are 100% reliant on imported crude oil. Our data sources show that Angola and the DRC are net exporters of crude oil, and that between 1998 and 2003, South Africa has on average been importing 95% of its crude oil requirements. This heavy dependence or reliance on imported oil is coupled by other country specific factors that reveal impact of the oil shock and the limited resources for the countries to cope with it. From Table 1, most of Southern Africa suffers from high external debts, high levels of human deprivation (see HPI-1 index) and income inequality (based on Gini coefficients), and that almost all these countries have a significant proportion of their population (between 50 and 87%) below the poverty datum line of US $2 a day. These in turn imply that the low levels of economic growth in these countries are further constrained to accelerate development and to achieve significant poverty reduction levels.

Dependence on oil as a resource, L_u/E_u, and the impact of an oil shock

The variable L_u/E_u defines the share of oil in the total energy mix, and is a useful factor in explaining oil vulnerability. The expression E_u includes both the commercial and non-commercial sources of energy. A conceptual problem that arises with the data for L_u/E_u is that this expression is based on physical units rather than on expenditure shares. The problem is minimised by expressing dependence in terms of expenditure values as $L_u * P_L / E_u * P_L$. As P_L cancels out, we get the same results from the two expressions.

The results in Table 2 show that oil shares as a proportion of total energy consumed per country have been falling in most countries, but rising in Angola, Botswana and Namibia. We deduce that the impact of oil price shocks is severe for Namibia with an average oil share above 60% and with the highest vulnerability (0.046 in Table 3). As summarised in Table 1, Namibia also has the high levels of inequality, very low HPI-I and, like other Southern African states, with a serious challenge of alleviating poverty. Although the oil share for Angola is high, Angola is a net crude oil exporter. Other main energy sources in Namibia are hydropower and biomass. Dependence is also high for the economies of Botswana (46%), Malawi (45%) and Lesotho (44%), which also suffer from high levels of poverty, deprivation and inequality (see Table 1).

We did not estimate cross price elasticities between oil and other energy inputs to establish interfuel substitution possibilities, mainly because of the highly aggregated nature of our data. It would be useful, for example, to examine the characteristics of demand across the various sectors of the economy, obviously expected to differ, and to illustrate the level of taxes/subsidies that would be required to encourage 'fuel-switching'. However, we observe that the oil shares and the trend lines (Table 2) for the rest of the countries are falling and almost constant (flat) for South Africa. While the trend lines for Botswana and Namibia as well as for the net exporting countries are positive, it is fluctuating and almost constant for South Africa, and negative for the rest of the other countries. This can be attributed to fuel substitution taking place. Botswana records the least level of vulnerability and rising oil share in its energy mix (Tables 3 and 2), likely because of the diversification thrust as it pursues its development policies.

Energy intensity, (L_u/GDP, E_u/GDP)

Energy and oil intensities are important factors that explain oil vulnerability. Energy intensity is the energy use per dollar of GDP, and is also the amount of energy needed to support economic activity. Simply, it is the cost of converting energy into GDP, so that using less energy to produce the same product reduces the intensity. Some analysts argue that energy intensity is the inverse of energy efficiency, so that any decline in energy intensity can be regarded as a proxy for efficient improvements. Validating this assertion would require information on technology for the various sectors in different countries which, unfortunately, is concealed in the highly aggregated nature of currently available data.

There is consensus in literature that low energy intensity (meaning lower costs of converting energy into GDP) keeps vulnerability down and, alternatively, that increases in energy intensity leads to an increase in vulnerability to oil shocks. With reference to Table 4, this implies that the higher the energy intensity the more vulnerable the country is to oil shocks. Similarly, low energy intensity helps to

Table 2: Oil fuel dependence

Country	*L_u/E_u (0 < x < 1) Average 2003*		*L_u/E_u Fitted trend line 1994 – 2003*	*L_u/E_u R^2*
Angola	0.68	0.71	Rising	0.54
Botswana	0.44	0.46	Rising	0.51
DRC	0.35	0.21	Falling	0.8
Lesotho	0.60	0.44	Falling	0.76
Malawi	0.50	0.45	Falling	0.83
Mozambique	0.40	0.14	Falls sharply	0.85
Namibia[1]	0.62	0.64	Rising	0.59
South Africa	0.21	0.20	Constant (flat)	0.007
Swaziland	0.40	0.33	Falling	0.87
Tanzania	0.62	0.59	Falling	0.67
Zambia	0.23	0.23	Falling	0.15
Zimbabwe	0.27	0.24	Falling	0.57

Note: [1] data from 1995 to 2003

Table 3: Estimated size of shock (as a percentage of 2003 GDP)
Source: Calculations based on IEA data, 2003

Country	*Oil vulnerability*	*Effect of average price rise from 2003 to 2004 (33%)*	*Effect of average price rise from 2004 to mid-2005 (72%)*	*2003 to mid-2005 cumulative impact*
Angola	-0.779	-25.387	-55.389	-80.775
Botswana	0.009	0.312	0.681	0.993
DRC	-0.009	-0.288	-0.628	-0.916
Lesotho	0.015	0.507	1.106	1.613
Malawi	0.035	1.145	2.497	3.642
Mozambique	0.023	0.754	1.645	2.399
Namibia	0.046	1.532	3.343	4.875
South Africa	0.034	1.138	2.483	3.622
Swaziland	0.025	0.826	1.802	2.628
Tanzania	0.022	0.710	1.548	2.258
Zimbabwe	0.021	0.687	1.498	2.185

Note: Angola and the DRC are net oil exporters, hence the negative results shown

keep vulnerability down. The pattern of energy intensity growth overtime in Southern Africa is mixed, with some countries exhibiting a positive growth trend (with Mozambique, Namibia and Lesotho leading) and a negative trend experienced by six countries. Countries with a negative trend line show the following different percentage growth patterns in energy intensity: a constant negative trend for Congo (Kinshasa); a tendency for the data series either to fluctuate constantly (Botswana) or fall, then rise from 1998 or 1999 (Angola, Lesotho, Malawi, Mozambique, Namibia, Swaziland and Tanzania), and for the data series to rise in 1998 and then maintain a negative trend thereafter (Zimbabwe). South Africa data series falls from 1998 to 2002, and then picks up in 2003.

There are two main problems with these energy intensity results. Firstly, they are at an aggregate level, with heterogeneous output. Secondly, the large use of biomass in different countries is largely uncaptured in GDP calculations.

Since most countries are completely dependent on imported oil (that is, $M_L/L_u = 1$), our results for oil intensity are identical to those of oil vulnerability reported in Table 3. Namibia, has the highest oil intensity of GDP, and is more vulnerable to oil price increases. The higher the oil intensity of GDP, the more vulnerable the economy to oil price increases, and the countries with a high oil/GDP ratio are harder hit than the others. While Dargays (1990 p

15) contends that the oil intensity of GDP rises from low to middle income, and being lowest for countries with highest incomes, our results do not quite confirm this finding. Rather, we agree with Bacon and Mattar (2005) about the lack of a significant correlation between changes in oil intensity and the growth in GDP per capita. However, we expect improved data to reflect increasing oil intensity as modern commercial fuels substitute traditional fuels in the household sector, and as transportation, economic growth and development continue.

Table 4: Energy intensities
Source: Calculations based on IEA data, 2003

Country	*Energy intensity for 2003 (Btu/ 2000 US$ using market exchange rates)*	*R^2 [$Y = \alpha + \beta X + \beta X^2$ (1994 to 2003)] Y = time X = data*	*Energy intensity trend line*
Angola	11 489	0.69	Falling
Botswana	9 014	0.49	Falling
Lesotho	6 882	0.70	Rising
Malawi	14 836	0.90	Falling
DRC	4 861	0.80	Falling
Mozambique	32 820	0.92	Rising
Namibia	13 924	0.81	Rising
South Africa	35 348	0.52	Falling
Swaziland	14 349	0.60	Rising
Tanzania	7 208	0.62	Rising
Zimbabwe	16 693	0.64	Falling

A number of factors explain why some countries have different energy intensity patterns. Firstly, energy prices are a major influence on energy use and therefore on energy intensity. Energy prices vary between countries depending on energy consuming technology, availability of fuel and regulatory regimes in place. Secondly, as in Bernstein et al (2003 p 14), capital investment and new constructions tend to have lower energy intensity because the new infrastructure is usually more energy efficient. Thirdly, the way energy types are mixed to produce output drives the demand for energy. The structure and the composition of economic output among the countries differ, thus affecting energy intensity. Fourthly, changes in demographic factors influence energy use and have an impact on energy intensity. For example employment and income growth lead to increased energy consuming appliances. Fifthly, technological change and penetration of modern appliances can either make energy use more efficient or increase energy intensity for some end uses. But expenditure on new equipment to replace old capital stock is often more efficient than the equipment being replaced. We expect all these factors to be at play for the various countries, thereby yielding different patterns of intensity results.

Undoubtedly, the risk of reducing energy price volatility implies taking into account benefits of reducing this exposure by measures such as energy efficiency, structural change, choices about energy investment and through strategic petroleum reserves. This, at least, guarantees that any oil price shock would cause less economic disruption, relative to GDP.

Challenges

The challenge Southern African countries face is to reduce dependence on imported oil while also meeting the challenge of development and economic growth. Oil and energy intensity through a variety of options. A very useful option is to disaggregate the data by sector, estimate the demand pattern of each sector and determine the cross-price elasticities of substitution for the different energy types and sectors. This gives useful information on the degree of substitution possibilities between oil and other energy types using fiscal policy and other financial incentives. The fiscal tool can also be used to encourage energy conservation, to promote transition to a lower energy intensity mix of economic activities, and to encourage an optimal fuel mix, depending on the distributional impact of the policy measure taken. Other demand management strategies involve improved energy end-use efficiency in industry, transportation and buildings. There is also a challenge for energy policy for these countries in terms of exploiting renewables.

But all these likely cases should be pursued through a combination of incentives, investments, and other measures that affect choices made with the available array of technological options and through research and development.

References

Bacon, R. and Mattar, A. 2005. The Vulnerability of African Countries to Oil Price Shocks: Major Factors and Policy Options. ESMAP. Report 308/5.

Bernstein, M. Fonkych, K., Loeb, S and Loughran, D. 2003. State-Level Changes in Energy Intensity and Their National Implications.

Dargay, J. 1990. Oil demand: Dependence or Flexibility? Oxford Institute for Energy Studies.

Davidson, O. and Sokona, Y. 2002. Think bigger act faster. EDRC/ENDA.

IMF (International Monetary Fund) 2004. Sub-Saharan Africa Regional Economic Outlook. International Monetary Fund 2004. www.imf.org/external/pubs/ft/afr/reo/2004/eng/02/pdf/reo1004.pdf.

International Energy Outlook 2004. Energy Information Administration/International Energy Outlook 2004. www.eia.doe.gov/oiaf/ieo/index.html.

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